

## REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

As a preliminary matter, Applicant notes the Office Action's acknowledgement of Applicant's Preliminary Amendment filed on December 27, 2005 which canceled claims 1-17 and added new claims 18-37, acceptance of the drawings and consideration of the Information Disclosure Statement, each also filed on December 27, 2005.

Claims 18-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0118489 to Hagan et al. (hereinafter "Hagan").

By this amendment, claims 19-21 have been canceled without prejudice to or disclaimer of the subject matter contained therein. Independent claims 18 and 37 have been amended to further define the subject matter Applicant regards as the invention as discussed in greater detail below. Claims 22, 24, 26, and 30 have been amended to update their dependence and claims 23, 25, 27-29 and 31-36 remain unchanged in the application.

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier. After amending the claims as set forth above, claims 18 and 22-37 are now pending in this application for consideration.

Applicant respectfully submits that the claims are patentably distinguishable over the cited reference as required by §103. Applicant further submits that the cited reference fails to disclose, teach or suggest Applicant's claimed fuel reformer having: (1) *a reforming section surrounding a combustion chamber*; (2) *a reforming additive water passage formed in a gap between outer walls of the high-temperature unit and the medium-low-temperature unit and an inner wall of the vessel*; (3) *a reforming additive water injection port provided at an end of the reforming additive water passage on a side opposite the side where the medium-low-temperature unit is connected to the high-temperature unit*; (4) *a second reforming additive water passage for supplying reforming additive water directly to the*

*high-temperature unit, not through the medium-low-temperature unit; and (5) a mixing chamber communicating the reforming additive water passage, the reforming material supply passage and the second reforming additive water passage* as now required by amended independent claim 18. Amended independent claim 37 is analogous to independent claim 18 and includes the same patentable features and arrangements. By contrast, the cited reference fails to disclose, teach or suggest these claimed features and arrangements. Accordingly, independent claims 18 and 37 and claims dependent therefrom are patentably distinguishable over the cited reference. This distinction will be further described below.

### **THE CLAIMS DISTINGUISH OVER THE CITED REFERENCE**

Claims 18-37 stand rejected as being unpatentable over Hagan. Applicant respectfully traverses the rejections of these claims, and submits that these claims are allowable for at least the following reasons.

The framework for the objective analysis for determining obviousness under §103 requires:

1. Determining the scope and content of the prior art;
2. Ascertaining the differences between the claimed invention and the prior art;
3. Resolving the level of ordinary skill in the pertinent art; and
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

*Teleflex, Inc. v. KSR Int'l Co.*, 127 S. Ct. 1727, 82 USPQ2d 1385 (2007); *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). In order to establish a *prima facie* case of obviousness, all the claim limitations must be taught or suggested by the prior art. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). See MPEP §2143.03.

The Cited Reference Does Not Suggest All Claim Recitations

The cited reference does not meet one of the requirements of MPEP § 2143, which is that “the prior art reference (or references when combined) must teach or suggest all the claim limitations.”

Embodiments of the present invention are directed to a fuel reformer. The fuel reformer according to independent claim 18 includes high and medium-low-temperature units, a connection flow pipe, a vessel, first and second reforming additive water passages, a reforming water injection port, a reforming material supply passage and a mixing chamber. The high-temperature unit has a combustion chamber in which fuel is burned. A reforming section is disposed on an outer peripheral surface side of the combustion chamber and filled with a reforming catalyst in an annular shape. The medium-low-temperature unit includes a shift converter section located on a side where the medium-low-temperature unit is connected to the high-temperature unit and filled with a shift converter catalyst in a cylindrical or annular shape. A selective oxidation section is located on a side opposite the side where the medium-low-temperature unit is connected to the high-temperature unit and filled with a selective oxidation catalyst in a cylindrical or annular shape.

The connection flow pipe supplies reformatte having passed through the reforming section of the high-temperature unit to the shift converter section side in the medium-low-temperature unit and the vessel is provided for integrally housing the high-temperature unit and the medium-low-temperature unit connected by the connection flow pipe. The reforming material supply passage supplies reforming material to the high-temperature unit.

According to one embodiment of the present invention as now required by amended independent claim 18, the reforming section surrounds the combustion chamber. Also, the reforming additive water passage is formed in a gap between outer walls of the high-temperature unit and the medium-low-temperature unit and an inner wall of the vessel and the reforming additive water injection port is provided at an end of the reforming additive water passage on a side opposite the side where the medium-low-temperature unit is

connected to the high-temperature unit. Further, the second reforming additive water passage supplies reforming additive water directly to the high-temperature unit, not through the medium-low-temperature unit and the mixing chamber communicates with the reforming additive water passage, the reforming material supply passage and the second reforming additive water passage. Independent claim 37 is analogous to independent claim 18 and includes the same patentable features and arrangements. Support for the subject matter recited in independent claims 18 and 37 can at least be found in canceled claims 19 and 21, on page 6, lines 5-12 and on page 7, lines 5-12 of the present specification. With these features and arrangements, the start-up time can be shortened by preheating the medium-low-temperature unit without using a heating medium such as nitrogen (Specification, page 7, lines 18-21). Also, since the medium-low-temperature unit is preheated before introduction of the reformat, condensation of water on the shift converter catalyst layer and the selective oxidation catalyst layer at the time of introduction of the reformat can be prevented which extends the lives of each of these catalysts (page 7, lines 21-26). Furthermore, thermal efficiency can be improved (page 6, lines 13-18).

One exemplary embodiment of the present invention is illustrated in FIG. 1 which shows the reforming section 7 surrounding the combustion chamber 5A, the reforming additive water passage 40 formed in a gap between outer walls of the high-temperature unit 2 and the medium-low-temperature unit 3 and an inner wall of the vessel 1, the reforming additive water injection port 41 being provided on a side opposite the side where the medium-low-temperature unit 3 is connected to the high-temperature unit 2 (i.e., at the bottom of the reformer 1), the second reforming additive water passage 45 supplying reforming additive water directly to the high-temperature unit 2 via a flow control valve 65 provided in a second reforming additive water injection passage 67 and not through the medium-low-temperature unit 3 and the mixing chamber 44 communicating with the reforming additive water passage 40, the reforming material supply passage 50 and the second reforming additive water passage 45. Applicant respectfully submits that the cited reference fails to disclose, teach or suggest these claimed features and arrangements as well as the benefits provided.

The Hagan reference is directed to fuel processor modules which are individual

operating components integrated into a common housing 14, with the modules being individually contained in one or more vessels with attendant connectivity structures such as pipes, tubes or wires (Hagan, abstract, lines 1-5). As illustrated in FIG. 2 of Hagan, a fuel processor 10 includes a cylindrical module 12a which may include a partial oxidation reaction section 20 thermally coupled with an autothermal reforming (ATR) section 22 and a cylindrical module 12b which may include a high temperature water-gas shift (HTS) in section 16 and a low temperature water-gas shift (LTS) in section 18 (paragraph 34, lines 13-20). An outlet port 54 is provided at one end of the housing 14 and an inlet port 56 is provided at the other end of the housing (paragraph 53, lines 1-7). According to an alternative embodiment of Hagan's fuel processor 11 which is illustrated in FIG. 5, cylindrical module 34 houses preferential oxidation in one or more states or thermal gradients, cylindrical module 36 houses HTS and LTS successively and cylindrical module 38 houses ATR (paragraph 38, lines 1-4). An outlet port 64 is provided at one end of the housing 40 and an inlet port 68 is provided at the other end of the housing (paragraph 55, lines 1-6).

Hagan, however, fails to disclose, teach or suggest the claimed reforming section, reforming additive water passage, reforming additive water injection port, second reforming additive water passage and mixing chamber. In Hagan, the reforming section does not surround the combustion chamber as claimed. At best, Hagan's reforming section is merely provided on one side of the combustion chamber (e.g., FIG. 2 shows the HTS, which includes the combustion chamber, provided on one side of either the partial oxidation reaction section 20 or the ATR section 22). Thus, this feature and arrangement is neither disclosed, taught or suggested by Hagan.

Also in Hagan, there is only one inlet port and only one outlet port corresponding to only one passage for each port. This is clearly illustrated in FIG. 4 of Hagan. As a result, it is impossible for Hagan's fuel processor embodiments to include two separate reforming additive water passages as specifically required by the claims. Thus, there is absolutely nothing in Hagan that remotely teaches or suggests a reforming additive water passage being formed *in a gap between outer walls of the high-temperature unit and the medium-low-temperature unit and an inner wall of the vessel*. To the contrary, Hagan's passages are

formed within the cylindrical modules and also in a gap between the cylindrical modules (i.e., the insert modules 28 shown in FIG. 2). Further, there is absolutely nothing in Hagan that remotely teaches or suggests the second reforming additive water passage supplying reforming additive water directly to the high-temperature unit, not through the medium-low-temperature unit. To the contrary and as clearly illustrated in FIG. 2 of Hagan, inlet port 56 receives fuel, steam, water and oxygen or any combination and supplies it to the LTS 18 and then the HTS 16 which carry out a reforming process in module 12b. Thus, there is nothing in Hagan that shows, teaches or suggests water being supplied directly to the high-temperature unit and not the medium-low-temperature unit.

Furthermore, there is no disclosure, teaching or suggestion in Hagan of a reforming additive water injection port provided at an end of the reforming additive water passage on a side opposite the side where the medium-low-temperature unit is connected to the high-temperature unit. Comparing FIG. 1 of the present invention to FIG. 1 of Hagan, clearly illustrates a reforming additive water injection port 41 provided at the medium-low temperature unit *verses* an outlet port 54 provided at the high temperature water-gas shift (HTS). Thus, Hagan also fails to disclose, teach or suggest this claimed feature.

Finally, the Office Action states that Hagan generally discloses that the modules can contain one or more of catalysts, catalytic reaction zones, adsorbents, heat exchangers, mixers, or other units (Office Action at page 4). Applicant respectfully submits that the Hagan reference fails to disclose, teach or suggest a mixing chamber arranged such as to communicate with the reforming additive water passage, the reforming material supply passage and the second reforming additive water passage as required by the claims.

In view of the fact that the cited reference fails to disclose, teach or suggest each of the claimed features and arrangements indicated above, this reference cannot be said to render obvious the invention which is the subject matter of independent claims 18 and 37. Thus, independent claims 18 and 37 are allowable. Since independent claims 18 and 37 are allowable, claims dependent therefrom, namely claims 22-36 are also allowable by virtue of their direct or indirect dependence from allowable independent claims 18 and 37 and for containing other patentable features. Further remarks regarding the asserted relationship

between any of the claims and the cited reference are not necessary in view of their allowability. Applicant's silence as to the Office Action's comments is not indicative of being in acquiescence to the stated grounds of rejection.

In sum, one of the requirements of MPEP § 2143 is not satisfied in the Office Action with respect to any of the claims rejected as obvious because the cited reference does not teach each and every element of the present invention. Thus, the present claims are allowable.

The Level of Ordinary Skill In the Art has Incorrectly Been Ascertained

*KSR* did not repeal the *Graham v. John Deere Co.* factors - just the opposite, it reaffirmed them. One of those factors is the requirement that the PTO must resolve the level of ordinary skill in the pertinent art. It is respectfully submitted that the PTO presumes a higher level of skill of the ordinary artisan in this art than was actually present at the time of the invention.

The ordinary artisan would not have had a level of skill sufficient to render the invention obvious to that ordinary artisan. Specifically, before the disclosure of the present invention, the ordinary artisan would not have had the skill to predict that the features of Hagan could be modified as is asserted in the Office Action. To the contrary, only the innovator would have had the skill necessary to predict such modification. The ordinary artisan would not have had the skills to arrive at the present invention without instruction from the innovator. The Office Action is silent in regard to addressing the requisite *Graham* factors.

Lack of Sufficiently Articulated Rationale to Modify or Combine the References

The Office Action fails to meet the requirement of providing a sufficiently articulated rationale to modify Hagan.

The Office Action correctly recognizes the deficiencies of Hagan in view of the claims with respect to the catalyst arrangement, the baffle and the expandable member and then asserts that these features are well known in the prior art and are obvious design choice

parameters. Thus, the Office Action is taking Official Notice, pursuant to MPEP § 2144.03. Applicant respectfully submits that general conclusions concerning what is basic knowledge to one of ordinary skill in the art without specific factual findings and some concrete evidence in the record to support these findings will not support an obviousness rejection pursuant to MPEP § 2144.03(B). Applicant respectfully submits that a fuel reformer having a catalyst arranged in an annular shape, a baffle plate provided in a gap at a joint between the high-temperature unit and the medium-low-temperature unit and an expandable member expandable and contractible in the axial direction of the connection flow pipe are not considered to be well known in the art. Applicant notes, however, that § 2144.03 allows an applicant “to traverse such an assertion,” and that when an applicant does so, “the examiner should cite a reference in support of his or her position.” (MPEP § 2144.03(C)) Absent a citation by the PTO of a reference that can be evaluated for all its teachings, Applicant hereby traverses the assertion that it would have been well known in the art to provide a fuel reformer with the catalyst arrangement, the baffle and the expandable member. Applicant thus requests, relying on § 2144.03, that the PTO cite a reference and exactly identify where such a reference teaches the alleged features.

Applicant respectfully submits that independent claims 18 and 37 and claims dependent therefrom are patentably distinguishable over the cited reference and thus, allowable. Further remarks regarding the asserted relationship between any of the claims and the cited reference are not necessary in view of their allowability. Applicant’s silence as to the Office Action’s comments is not indicative of being in acquiescence to the stated grounds of rejection.

### **CONCLUSION**

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment,



to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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